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ABSTRACT

A study identified adult learning principles critical for effective Web-based instructional design (WBID), barriers to effective WBID, and practices of professionals who design WBID. National experts in adult education and WBID were interviewed, and the resulting product was an online assessment that 10 Web-based instructional designers completed. Electronic document analysis of Web-based training/instruction was completed to examine the actual practices of instructional designers. Findings indicated the following: (1) 36 principles were found critical for design of effective Web-based training or instruction; and (2) 3 barriers that impede successful implementation of Web-based training or instruction were instructor accessibility and responsiveness, instructor's expectation of students, and fostering a participatory online learning environment. Asked to identify which of a subset of 22 adult learning principles they applied in design of Web-based courses, 100 percent of instructional designers said they applied 7 principles and 80 percent applied 3. Their courses were designed to allow learners to share experiences; to include aids that help relate new material to current knowledge and prior experiences; to provide graphics, examples, cases, analogies, and activities; to include checkpoints; and to allow learners to be self-directed. The researchers believed this project has implications for instructional design, professional development, and student retention. (Contains 25 references.) (YLB)

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# Instructional Design Factors and the Effectiveness of Web-based Training/Instruction

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*Despite the attention focused on the advantages of Web-based education and training for adult learners in adult education organizations, the adult learning elements within the instructional design of Web-based training/instruction have not been examined. The omission of this core factor can impede the successful delivery of instruction via the Internet. Therefore, the training may not be effective, which will cause major implications for the learner and the organization. The purpose of this project was to determine the adult learning principles that are critical for effective Web-based instructional design, barriers to effective Web-based instructional design, and the practices of professionals who design Web-based training/instruction. To determine these constructs, national experts in the areas of adult education and Web-based training design were interviewed and the resulting product was an online assessment, which was then completed by ten Web-based instructional designers. Electronic document analysis of Web-based training/instruction was completed to examine the actual practices of instructional designers. The outcome of this project yielded adult learning principles critical for effective development of Web-based training/instruction, factors that affect the Web-based instructional design process, and barriers that impede successful delivery of Web-based instruction.*

The good news about online learning is that everyone in interested in it. The bad news is that most of what's out there is not worth anything. (Bill Communications, 2000).

I had this same thought when I participated in my first web-based course, over five years ago. As a practitioner in training and development, I began to observe new demographic differences of adult learners and the challenges to traditional education and training programs these differences were bringing to the adult education environment. These challenges required that my company and other adult education providers utilize technology as a means to meet education and training needs. The Internet was beginning to emerge as an education and training delivery medium and everyone in the business of education or training from university and community college faculty to corporate trainers, began to "put courses online." As I moved into the academy, effective teaching and learning via technological means became a priority in my research.

Five years later, people continue to make the same statement concerning courses delivered via the Internet. Although the Internet has made education and training available to learners globally and has extended training programs across cultures, the question still remains about its effectiveness as a course delivery medium.

## The Issue/Problem

Adult education continues to evolve as a field of practice and research. However, "topics of research are not being expanded to address the evolving nature of concerns which affect the practice of adult education" (Dean, 1999). One of these concerns is the expansion of research related to web-based training/instruction. Web-based training/instruction is currently growing exponentially in all areas of adult education; however, research into this topic is not growing at the same rate.

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Web-based training/instruction, also referred to as Internet-based training, Intranet-based training, online learning, or online training, is broadly defined as a type of distance instruction delivered over the Internet or a company's Intranet (Alden, 1998; Hall, 1997). Specifically Web-based training/instruction is a form of Computer-based Training (CBT) that refers to a course available on an intranet, extranet, or internet that is linked to learning resources outside the course, such as electronic references, electronic mail, electronic discussions, and video conferencing (Carliner, 1999). In order to understand the magnitude of the problem to be described, it is important to conceptualize the types of Web-based training/instruction.

The term Web-based training/instruction has become a term used for any kind of training that is delivered via a network. However, training/instruction delivered using the Web can be specifically categorized as four broad types: Web/computer-based training/instruction; Web/electronic performance support systems; Web/virtual asynchronous classrooms; and Web/synchronous classrooms. Web/computer-based training/instruction is the most common type of Web-based training/instruction to provide learners with performance-based training/instruction including measurable goals and objectives. Web/electronic performance support systems provide learners with practical knowledge and problem-solving skills in a just-in-time format. A Web/virtual asynchronous classroom provides group learning in an asynchronous environment. In contrast, a Web/synchronous classroom provides collaborative group learning in a real-time synchronous environment (Driscoll, 1999).

Web-based training/instruction is fast becoming a primary method for course delivery. Indicators show that it will continue to grow as an educational medium and it has the potential to supplement or replace a wide range of instructor-led training programs (Bassi, Cheney, & Van Buren, 1998; Driscoll, 1999; Mantyla & Gividen, 1997). The United States market for Web-based training/instruction generated $197 million in revenue in 1997 and forecast reports show this market will exceed $6 billion by 2002. This growth is a compound annual growth rate of approximately 95% from 1997 to 2002 (Driscoll, 1999). Despite all the attention focused on Web-based training/instruction, there is still much to be learned concerning utilizing the Web to deliver instruction in business and industry and higher education. Web-based training/instruction is a rapidly growing delivery medium in the field of adult education. Hence, it is important to study areas that will impact the effectiveness of this technological delivery medium. One such area is that of instructional design.

There are several characteristics that lead to the effective design of training/instruction. These include: defined goals and objectives; specific, relevant content; focus on job relevance; varied methods of learning; regular participation of learners; learner's experience and knowledge; reinforcement; realistic and problem centered instructional examples; and application and follow-up. These characteristics of effective training/instruction are predicated on the inclusion of a number of adult learning principles. These principles supply practitioners with the foundation necessary to design effective face-to-face training/instruction for adults. The issue raised in this study was whether or not these same principles are required for the design of effective Web-based training/instruction. From this issue a key question was raised: Do web-based training/instruction instructional designers apply adult learning principles to the design of web-based training?

Although teaching and learning via the Web is growing at a steady pace, the current literature on Web-based training/instruction focuses primarily on the technical elements of design and not the adult learning principles that are necessary for effective design and adult learning. In the area of Web-based training/instruction there is a lack of study surrounding adult learning and Web-based training/instruction design. This lack of research reference could lead to the omission of critical principles with the design of Web-based training/instruction, which, in turn, can lead to major problems in effectiveness. From an organizational perspective, ineffective training/instruction can waste dollars invested in design, resources, and employee time. The costs to employers of employees who have not been properly trained for the skills required by their jobs can waste additional dollars. From a learning perspective, ineffective training can lead to problems in the transfer of training which can cause employees to feel demoralized because they cannot apply the skills to their jobs (Clark, 1994).

Web-based training/instruction is the fastest growing distribution of training programs in adult education today. It is imperative that adult learning principles are present in Web-based training/instruction to assure and increase effectiveness. In order to ensure the inclusion of these adult-learning principles, these principles must be clearly defined as they relate to Web-based training/instruction.



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**Theoretical Framework**

Several frameworks have been developed to define the elements of effective training/instruction. Two of the most frequently utilized are the Nadler's (1994) program design model and the Instructional Systems Design (ISD) model. In both models, once the cause of an employee performance problem has been determined and a non-instructional solution has been ruled out, instructional designers can follow a series of predictable steps to prepare workplace training. Both these frameworks are based on the assumption that effective training consists of a standard set of elements.

Although equally significant, each of the models is generic; that is, each could be used in training program design as well as in other fields of adult education. For the purpose of this study, a framework of effective training will consist of four elements. These elements were selected on the basis of their commonality within the frameworks. In addition, they are considered broad enough to encompass the differences that may exist between training design models. The four components include analysis, design, delivery, and evaluation. Not only are these key elements of effective training, but also, each of the elements are equally important in implementing effective training programs (Williams, 1996). Particularly important to the effectiveness of Web-based training/instruction is the element of design.

The design process consists of several elements that move the learner sequentially through a development process during training/instruction. These elements include preparing objectives, determining content, determining instructional methods and strategies, determining resources, application of content, and evaluation methods. In order to effectively produce these components, each of these elements should be predicated upon specific learning theories or approaches to learning. Learning theories provide instructional designers with verified instructional strategies and techniques for facilitating learning as well as a foundation for strategy selection. However, many instructional designers are operating under the constraints of a limited background in learning theory specifically those that are the basis of adult learning principles (Ertmer & Newby, 1993). The literature in instructional design attempts to familiarize designers with learning theories, which can provide structured foundations for planning and conducting instructional design activities. The theoretical framework for this study represents the positions on learning from the behavioral and constructivist perspectives.

***Behaviorism and Constructivism: A Teaching/Learning Match Made Online***

A major debate has surfaced about the basis of teaching and learning in an online environment. Of the current theories that support instructional design for Web-based training/instruction, behaviorism has historically had the greatest impact. However, more online courses are being designed from the constructivist view. Hence, a theory war has surfaced relative to teaching and learning online. The opponents in this war are the principles undergirded by the behaviorist perspective and the principles that are the foundation of constructivism.

*Behaviorism and Instructional Design*

Historically, behaviorism methods have been used to present students with information that they then repeat back to the teacher. These methods have been predominant in training and development (Peterson & Cooper, 1999). Behaviorists view psychology in terms of resulting behaviors that can be modified by consequences such as rewards or punishments. Behaviorism was used as the basis for designing early audio-visual materials and was the impetus for many related teaching strategies such as teaching machines and programmed texts. Thorndike's connectionism, Pavlov's classical conditioning, and Skinner's operant conditioning were ideas used to give direction to the early researchers who examined the impact of technology on teaching and learning (Thompson, Simonson, & Hargrave, 1992). Although some schools of thought believe that there is much about behaviorism that is unattractive to learning, particularly adult learning, a great deal is owed to those theorists who advocated behaviorist principles in teaching using technology.

Embedded in many of the current instructional design practices are the basic assumptions and characteristics of behaviorism. Ertmer and Newby (1993) identify specific principles that have direct relevance to instructional design. These principles and the instructional design applications include the following

1. An emphasis on producing observable and measurable outcomes in students. Instructional design elements include creating objectives, performing task analysis, and competency-based assessment.
2. Pre-assessment of students to determine where instruction should begin. Instructional design element is the initial learner analysis.
3. Emphasis on mastering early steps before progressing to more complex levels of performance. Instructional design requires the sequencing of instruction presentation to master learning.
4. Use of reinforcement to impact performance. Tangible rewards and informative feedback are important elements in effective instructional design.
5. Use of practice and application to ensure a strong stimulus-response association. Simple to complex sequencing of practice and the use of prompts are elements of effective instructional design.

*Constructivism and Instructional Design*

The trend in teaching and learning in Web-based environments tends to be constructivist, which is based, in cognitive psychology. With this model, students are viewed as active participants and processors of information. Constructivism, which has as its synonyms active learning, adult learning, and self-directed learning, is changing the way educators think about teaching and learning. The constructivist perspective believes that learners approach a learning task with a set of personal beliefs, motivations, and conceptions about the subject area and the knowledge to be taught (Holmes & Leitzel, 1993). Kember and Murphy (1990) cite that when learners are taught, they construct meanings from the material by relating it to their existing conceptions, frameworks, and knowledge. The implications of constructivism on teaching and learning in a Web-based environment require that teaching methods be selected and implemented that draw on the participant's experience and fosters participation from the participants.

Instructional design from the constructivist perspective specifies methods and strategies that will assist learners in actively exploring complex topics. The content is designed so that knowledge is linked to the context under study and to the experiences that the learners bring to the context. Some of the specific strategies used in this paradigm include situating tasks in real world contexts, presentation of multiple perspectives such as collaborative learning to develop and share different views, and social negotiation using such techniques as discussions and debates (Ertmer & Newby, 1993). The following are principles from the constructivist paradigm that have direct relevance to the instructional design process (Ertmer & Newby, 1993; Wilson, 1996)

1. An emphasis on identifying the context in which the skills will be learned and applied. Applying learning in meaningful contexts is a design application of this principle.
2. An emphasis on learner control and the capability of the learner to manipulate information. A major premise in the instructional design process is for the learner to actively use what is being learned.
3. The need for information to be presented in a variety of different ways. To reinforce important content, the instructional design process allows for revisiting content at different times, in rearranged contexts, for different purposes, and from different perspectives.
4. Supporting the use of problem-solving skills that allow the learner to expand their thinking beyond the information given. An application for instructional design would include developing alternative ways of presenting problems.
5. Assessment focuses on transfer of knowledge and skills. Learner assessment in instructional design presents new problems and situations that differ from the conditions of the initial instruction.

Behaviorism and constructivism have common grounds such as the use of feedback and the importance of assessment. However in teaching and learning situations, the behaviorist wants to take the learner and produce desired behaviors by controlling the environment and the constructivist wants to observe how learning occurs. Both these views are important for online teaching and learning and are critical to provide a rich teaching and learning environment. The nature of the Internet provides a perfect vehicle to integrate behaviorist and constructivist theories in order to understand the totality of teaching and learning in an online environment (Williams, 2000).

Adult learning principles can be derived from both the constructivist and behaviorist perspectives. Some researchers may consider it improper to integrate these views on learning when designing training for adults. However, drawing upon the literature on this subject, this researcher takes the risk to assert that the integration of these theories in the design of web-based training will provide a variety of strategies and techniques and indicate how these factors might best fit within a given context with adult learners (Williams, 2000).

**Purpose of the Study**

The theoretical framework that guided this study focused on the principles of the behaviorist and constructivist perspectives, specifically adult learning principles, as they are related directly to the instructional design process. The adult education and training literature indicates that the elements of an effective instructional design process are: (a) application of adult learning principles, (b) analyzing the needs of the learner, (c) organization and administration factors that affect training, (d) characteristics of training resources and (e) expertise of the trainer. Application of these elements in the instructional design process is critical for the success of learners who are working independent of face-to-face interaction with an instructor. Hence, the omission of any of these elements can make a significant impact on the effectiveness of Web-based training.

Russ-Eft (1994) states that there are two factors that impede the successful training through technological means. They are: (a) the lack of application of adult learning principles in the training and (b) Web-based training instructional designers who do not possess adult learning competencies and cannot apply them in a Web-based environment. Although each of the elements of effective instructional design are important and critical to the design process, this study focused on the element of the application of adult learning principles. Instructional designers must translate principles of learning into specifications for instructional material and activities (Smith & Ragan, 1993). If this critical element is missing from the process, then the validity of the training/instruction is questionable and learners may not be prepared to perform on the job. Therefore, the purpose of this study was to determine the adult learning principles that are critical for effective Web-based instructional design, barriers to effective Web-based instructional design, and the practices of professionals who design Web-based training/instruction.

**Specific Questions the Study is Designed to Address**

The following questions were used as a framework to guide this study.

1. What adult learning principles are critical for the effective design of Web-based training/instruction?
2. What factors affect the instructional design process for Web-based training/instruction?
3. From the perspective of the learner, what barriers exist that impede the successful delivery of Web-based training/instruction?
4. Do instructional designers apply principles of adult learning when designing Web-based training/instruction for adults?

**Data Collection and Analysis**

This qualitative study was conducted in three phases. The first phase consisted of conducting face-to-face and online individual interviews to determine and verify the content for an assessment instrument of Web-based courses. Phase two consisted of the development of an online assessment instrument to determine the application of adult learning principles in the design of Web-based training. The final phase involved analyzing, via electronic document review, ten Web-based training courses designed by instructional designers in business and industry and higher education.

***Phase I:***

In order to determine the adult learning theory and principles required for effective Web-based training design, open interviews with national adult education experts who are currently designing and implementing Web-based training/instruction were conducted. Five adult educators, from the areas of human resource development and higher education including colleges, universities, and community colleges, were selected and face-to-face interviews conducted.

Three criteria were used to select these adult educators. They were

1. The adult educator must teach or train in an adult education organization.
2. The adult educator must have designed (determined content/instructional methods/objectives) for at least one Web-based course.
3. The adult educator must be responsible for the evaluation of students participating in the Web-based course.

The five adult educators who participated in the study were identified and selected based on the above criteria in addition to their experience in designing Web-based instruction in their adult education specialty area of practice.

The open interview questions focused on adult learning principles and approaches to Web-based design. Three questions guided the interview process:

1. What are the things that work well when teaching adults in a Web-based training/instruction environment and what does not work well?
2. Do you have a set of principles that guide your design of Web-based training/instruction?
3. Do your beliefs and philosophy about adult education guide your design of Web-based training/instruction?
4. Identify any barriers to your design and development of Web-based training/instruction.

In order to strengthen the study design, interviews with adult learners who have completed Web-based training/instructional courses were also conducted. The purpose of the student interviews was to determine from an adult learner perspective any barriers to future participation in Web-based training/instruction. The interview participants in this study were graduate students who over a two-year period of four academic semesters completed a Web-based course in an adult education program. A total of ninety students who completed Web-based courses in the program were interviewed by conducting standardized open-ended interviews via an asynchronous electronic discussion board.

In the standardized open-ended interviews, the exact wording and sequencing of questions were determined in advance and all students were asked the same questions in the same order. Utilizing this method of interviewing ensured complete responses from each interview and it increased the comparability of the responses (Patton, 1990). For these participants, the electronic discussion interview technique was appropriate because students who participate in online courses are usually accustomed to and familiar with communicating using an asynchronous electronic discussion tool. Because the ability to communicate in an online environment is a requirement for participation in all web-based courses in the program of which these adult learners were students, the researcher did not select a more traditional means for interviewing.

The student participants were asked the following open-ended questions:

1. What instructional methods were used to facilitate discussion in your Web-based course?
2. How did the use of these instructional methods affect your learning in the Web-based course?
3. Describe the interactions you had with other students and the instructor. (This interaction could be online or face-to-face.)
4. How did this interaction occur (face-to-face, e-mail, online discussion)? Please be specific in your answer.
5. Did the instructor encourage student-faculty interaction either online or face-to-face?
6. Describe the accessibility of the instructor during the web-based course? Was the instructor responsive to your questions and concerns during the course?
7. Describe the feedback mechanisms you received during the course in relation to assignments and/or questions?

The data consisted of electronic text from the responses of each individual interview. The electronic text was verbatim directly from the participants; therefore, no transcribing was necessary. The data analysis was conducted as an activity simultaneously with the data collection and data interpretation. As the verbatim data were collected electronically, it was analyzed by sorting into categories.

***Phase II:***

The second phase of the study consisted of the development of an online assessment instrument. The purpose of the assessment instrument was to determine the current practices of Web-based training/instruction practitioners from the context of the inclusion of adult learning principles, barriers to effective Web-based training design, and approaches to Web-based design.

The literature focusing on behaviorism, constructivism, and their application to instructional design was critical in the item generation for the assessment instrument. The interviews with national adult education experts who are currently designing and implementing Web-based training/instruction and students who have completed Web-based training/instruction served as a second source used for item generation. The assessment instrument was tested for content validity by an expert panel of six adult educators who currently teach courses in Web-based instructional design. The expert panel consisted of faculty from four higher education institutions from the fields of adult education, instructional technology, and instructional design. These experts were selected based on recommendations by Nunnally and Bernstein (1994) that participants in content validity efforts should be as representative as possible of the types of individuals who will eventually be studied with the instrument.

***Phase III:***

The third phase of the study consisted of reviewing the current practices of Web-based training/instruction design. The participants for Phase III of the study consisted of Web-based training instructional designers from a cross section of adult education providers including business and industry, higher education, and community colleges. A total of twenty-five instructional designers were selected to participate. The process to select the participants consisted of first identifying those adult education organizations whose major function is the design and delivery of Web-based training/instruction. Second, the instructional designers in these organizations were identified and contacted to determine their interest in participating in the study. If the instructional designer agreed to participate, they were sent an electronic document detailing the phases of the study. Ten of the twenty-five instructional designers agreed to participate.

To determine adherence to adult learning principles in instructional design of Web-based training/instruction, the instructional designers completed the assessment instrument designed in Phase II. In addition, the participants were asked to allow the researcher access (via the Uniform Resource Locator of the course) to the electronic versions of implemented Web-based training/instruction they had designed. Using the method of electronic document review, the content of the Web-based training/instruction was analyzed for the inclusion and demonstration of adult learning principles. The content item for the analysis was the assessment instrument completed by the instructional designer.

The technique used to analyze the web-based courses was electronic document review with the specialized approach of content analysis. Content analysis is considered a "data collection technique and an analytic strategy which entails the systematic examination of forms of communication to document patterns objectively" (Marshall & Rossman, 1995, p. 85). In this research, electronic document review was used to examine each of the Web-based courses. The researcher used the combination of electronic document analysis and evaluation assessment rather than conducting individual interviews because "document analysis provides a behind-the-scenes look at the program that may not be directly observable and about which the interviewer might not ask appropriate questions without the leads provided through the documents" (Patton, 1990, p. 245).

**Findings**

This study suggests the following findings relevant to adult learning and Web-based training/instruction.

***What adult learning principles are critical for the effective design of Web-based training/instruction?***

The literature encompassing constructivism, including adult learning theory, and behaviorism suggest numerous principles that are required for effective instructional design. Adult educators who have designed Web-based learning experiences for adults suggest that there are certain principles that are critical to the design of the Web-based training/instruction for effectiveness and learning to occur. Hence, the following list of thirty-six principles is considered critical for the design of effective Web-based training/instruction:

1. The adult educator must access the learner's objective for learning before beginning to design a Web-based course.
2. Training/instructional objectives must be based on the goals or a desired competency output of the learner.
3. Training/instructional modules should be designed based on the background, such as demographics and learning styles, of the learners.
4. Training/instructional modules should be designed based on the participants' personal or professional goals for training.
5. Training/instructional modules should be designed based on content for Web-based training so that it is meaningful and relevant to the learner.
6. Learners should be allowed to participate in the development of criteria for evaluating their performance.
7. Learners' current knowledge and understanding of the content should be tested before they begin the Web-based course.
8. Learners should be allowed to customize the web-based training/instructional material based on their current knowledge and understanding of the subject.
9. The Web-based training/instruction should be adapted to the learner's current level of experience and skill.
10. The learner's current expectations, needs, and previous experience should be assessed as it relates to the current training/instructional material.
11. The learners should be allowed to diagnose the gaps between their goals and their present level of performance.
12. Learning activities should be designed for Web-based training/instruction based on the prior experiences of the learners.
13. The content of the Web-based training/instruction should be related to the concerns of the organization.
14. Web-based training/instruction should be designed so that learners can share work or personal experiences.
15. Aids should be included in the Web-based training/instruction that help the learner relate new material to current knowledge and prior experiences.
16. During the design of the Web-based training, potential problems the learner may have with the material should be anticipated and include activities to help with these anticipated problems.
17. The instructional designer should provide relevant examples and activities to help the learner understand the material.
18. Web-based training/instructional activities should be designed that are directly associated to and relevant to content.
19. Web-based training/instructional activities should be designed that allow learners to be self-directed.
20. Web-based training/instructional activities should be designed that are accompanied by resources and guides.
21. Graphics, examples, cases, and analogies should be included in the Web-based training/instruction to make ideas easier to understand.
22. Graphics, examples, cases, and analogies used in Web-based training/instruction must be relevant and realistic to the learner.
23. Activities and experiences must be designed such that the learner has the opportunity to explore goals and expectations.
24. Feedback, both positive and negative, must be integrated into the learning activities.
25. Feedback on objectives must be provided to the learners as a part of the training/instruction.

26. Web-based training/instruction should be designed to include checkpoints with questions, problems, or activities to ensure that the learner was able to follow and understand the content.
27. Web-based training/instruction should be designed using a variety of methods to provide a way for learners to comprehend what has been taught; if it was not initially clear.
28. Web-based training/instruction should be designed so that one idea is presented at a time in order to aid comprehension.
29. Web-based training/instruction should be designed so that there are frequent summaries to facilitate retention and recall of information.
30. The life stages of adults should be taken into account when designing Web-based training/instruction for adults.
31. Web-based training/instruction should be designed to allow for viewpoints from people in different life stages with different values.
32. Web-based training/instruction should be designed to allow for sharing of interpretations of information.
33. The content in Web-based training/instruction should be designed to appeal to more than one developmental life stage.
34. Web-based training/instruction should be designed to include on the job post-testing.
35. Web-based training/instruction should be designed to allow for interactions, both learner with learners, as well as, interactions between the instructor and the learner, during training/instruction that focuses on using the new knowledge or skills back on the job.
36. Web-based training/instruction should be designed to include instructional strategies, such as simulations and role play, that reflect the real world work environment.

***What factors affect the instructional design process for Web-based training/instruction?***

This study found that four specific factors affect the instructional design process for Web-based training/instruction from the perspective of the instructional designer. These factors are shown in Figure 1.

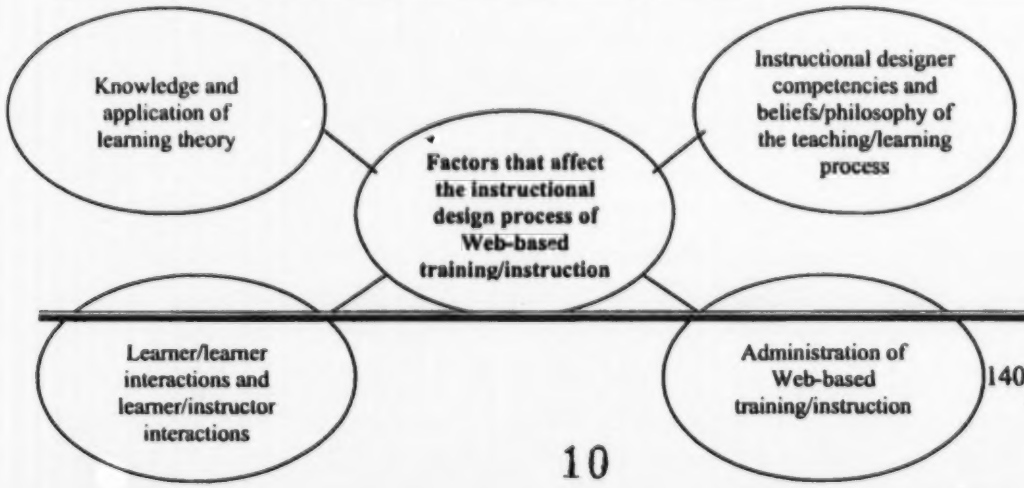
***From the perspective of the learner, what barriers exist that impede the successful delivery of Web-based training/instruction?***

This study identified several overall barriers that impede the successful implementation of Web-based training/instruction. What is documented in this report are those barriers that, from the perspective of the learner, may be the result of ineffective instructional design. The three barriers that emerged from the interviews with the learners who completed a Web-based course were

1. Accessibility and responsiveness of the instructor
2. Instructor's expectation of the students
3. Fostering a participatory online learning environment

These barriers that hinder the successful application of Web-based training/instruction are focused on learner-instructor interactions. What follows are components of the interview data for each of the three barriers.

**Figure 1. Factors that affect the instructional design process of Web-based training/instruction**


Knowledge and application of learning theory
Instructional designer competencies and beliefs/philosophy of the teaching/learning process
Factors that affect the instructional design process of Web-based training/instruction
Learner/learner interactions and learner/instructor interactions
Administration of Web-based training/instruction

*Accessibility and Responsiveness of the Instructor*

Accessibility and responsiveness of the instructor during a Web-based course emerged throughout each of the interviews as a barrier to learning in a Web-based course. The following quotes from participants represented these experiences

- "For one course I was extremely disappointed. There was almost no contact or feedback from the instructors. The format was divided into content instructor and technical instructor. The technical instructor made a few contacts and gave feedback, but the content instructor responded to nothing, not even phone calls. It was very insulting to have a professor flat out ignore you. For the other course, the feedback has been prompt and consistent. The instructor is extremely accessible and encourages students to utilize on campus office hours if clarification is needed on class topics."
- "There were periods of time in which we had no interaction with the course instructors. They were inaccessible by email, phone, and face to face interaction."
- "There were delays in the beginning of the class that made me feel disconnected."
- "I did not receive any feedback on any of the work that I turned in. I feel that this would not have been an issue in a traditional classroom setting where I could talk to that teacher face to face."
- "It (the responsiveness of the instructor) definitely has me questioning if I want to enroll in another web-based course."
- "(The way the instructor responded to my questions was) somewhat of a barrier, I have other life activities to manage. It is difficult when one needs an answer to proceed, and the professor's schedule is unknown. It is a frustrating to have to periodically check my computer, and there is no response."

*Instructor's Expectation of the Students*

A second category that emerged from the data surrounding learner - instructor interaction was the instructor's expectation of the students. Statements that represent these experiences of the learner are

- "The expectations were maybe a little too high considering the nature of the instruction."
- "Given the concern of design/response structure of the computer-based course, it was a challenge for a 'first-timer'; I lacked experience. The instructor did attempt [to address] this concern with an 'orientation' session."

*Fostering a Participatory Online Learning Environment*

Fostering active participation of students is a major tenet of adult learning and training. This action establishes a learning environment that is conducive for effective learning. This item was not identified as a barrier; however, the learners identified it as critical to effective Web-based training/instruction. The following statements represent this theme

- "Active participation of students was encouraged by utilizing project based learning. (Group project and case study requiring the student to interact with others in the field)."
- "The instructor was actively involved in participating in the group forums as a part of learning."

***Do instructional designers apply principles of adult learning when designing Web-based training for adults?***

A master list of adult learning principles critical for the effective design of Web-based training/instruction was identified in Phase I of the study and its components were listed in a previous section of this report. Although each of the thirty-six principles identified previously are critical for effective instructional design, they could not all be evaluated within the scope of this project. Therefore, a subset of these principles was used as the foundation for the online assessment instrument and the electronic document analysis tool. The assessment instrument included thirty-six items and the document analysis tool included twenty-two items that could be directly identified by the researcher when reviewing the web-based courses electronically. An electronic copy of the assessment instrument can be found at http://www2.ncsu.edu/unity/lockers/project/houlescholars/. What follows is a summary of the actual application of the adult learning principles in the Web-based courses by the instructional designers who participated in the study. The percentages, shown in Table 1 in descending order, represent the number of instructional designers (n = 10) who applied the adult learning principle in the design of the analyzed Web-based course.

**Impact**

By exploring adult learning principles in the context of Web-based training/instruction, this study raises a number of questions and implications for adult education practice and adult education research. What follows is a discussion of the impact of this project to the field of adult education.

***Impact on Adult Education Practice: Implications for Instructional Design, Professional Development, and Student Retention***

*Instructional Design*

Traditionally, the instructional design of Web-based training/instruction has not received as much attention as the technical aspects. However, instructional design is the foundation for effective teaching and learning in an online environment. Without effective instructional design, a course delivered via the Web has no learning impact. This study supports the school of thought that effective Web-based training/instruction is predicated on the inclusion of adult learning principles into the instructional design.

The theoretical framework for this study focused on integrating elements of constructivism and behaviorism into the instructional design process. Utilizing these and other theories of learning will require that instructional designers become proficient in the content and application of these theories. Instructional designers must understand the needs of the learner and be able to apply learning principles to those needs in a Web-based environment, specifically in the area of instructional strategies and feedback. The instructional

**Table 1. The Application of Adult Learning Principles in Web-based Instructional Design**

| Adult Learning Principle in Instructional Design | Percentage of Instructional Designers (n = 10) |
|---|---|
| Web-based training/instruction is designed so that learners can share work or personal experiences. | 100 |
| Web-based training/instruction includes aids that help the learner relate new material to current knowledge and prior experiences. | 100 |
| Relevant examples and activities are provided to help the learner understand the material. | 100 |
| Designed activities that are directly associated to and relevant to content. | 100 |
| Graphics, examples, cases, and analogies are included in the Web-based training/instruction. | 100 |
| Graphics, examples, cases, and analogies used in Web-based training/instruction must be | 100 |

| | |
|---|---|
| relevant and realistic to the learner. | |
| Checkpoints with questions, problems, or activities are included to insure that the learner was able to follow and understand the content. | 100 |
| Designed activities that allowed learners to be self-directed. | 80 |
| Web-based training/instruction is designed to allow for sharing of interpretations of information. | 80 |
| Web-based training/instruction is designed to include instructional strategies that reflect the real world work environment. | 80 |
| Potential problems that the learner may have with the material are anticipated and activities are included in the Web-based training/instruction to help with these anticipated problems. | 60 |
| Create resources and guides to accompany the activities. | 60 |
| Learners' current knowledge and understanding of the content is tested before they begin the web-based course. | 20 |
| A variety of instructional methods was utilized to provide a way for learners to comprehend what has been taught if it was not initially clear. | 20 |
| One idea is presented at a time in order to aid in comprehension. | 20 |
| Feedback is integrated into the learning activities. | 10 |
| Feedback on objectives is provided to the learners as a part of the training/instruction. | 10 |
| There are frequent summaries to facilitate retention and recall of information. | 10 |
| Activities and experiences are designed so that the learner has the opportunity to explore goals and expectations. | 0 |
| The content in Web-based training/instruction is designed to appeal to more than one developmental life stage. | 0 |
| Web-based training/instruction is designed to include on the job post-testing. | 0 |
| Web-based training/instruction is designed to allow for interactions during training/instruction that focus on using the new knowledge or skills back on the job. | 0 |

designers who participated in the study (see Table 1) illustrates the need to focus on integrating various instructional methods into the design of Web-based training/instruction. In addition, this study shows that feedback is critical to effective Web-based training/instruction even though instructional designers may not include it when designing a web-based course.

This project has already had an impact on the field of adult education in the form of new course development. I have developed a new course for the Department of Adult and Community College Education entitled "Strategies for Web-based Instruction." The content for this course was derived from this study on teaching and learning in a web-based environment. The focus of the course is the integration of adult learning theory into the instructional design of Web-based training/instruction. It helps the student to understand learning theory and how to integrate it into instructional design, specifically Web-based instructional design. The students in this course are traditionally Web-based instructional designers from business and industry, higher education, and non-profit organizations. Applying the concepts from this study has allowed me to teach instructional designers the content that is critical to design effective Web-based training/instruction.

This study will also contribute to the knowledge base of the training/instructional profession by presenting models for effective Web-based training/instruction design. These models can lead to the development of enhanced principles of adult learning for Web-based training/instruction in addition to standards for Web-based training design and evaluation. This study has also advanced techniques used in training/instructional design and evaluation. Tools have been developed to evaluate Web-based training/instructional design elements from different learning perspectives. These tools can be disseminated into the fields of adult education and training and used by practitioners, evaluators, and administrators to enhance design and accountability.

***Professional Development***

This study shows that professional development is needed if instructional designers in business and industry, higher education, and non-profit organizations are going to use the Web effectively for teaching and learning. If instructional designers from all areas of education are going to participate in the changing nature and delivery of education, then investments in professional development are needed. Educational organizations must not believe that because an instructional designer produced face-to-face courses, that he or she will have the skills necessary to develop Web-based courses. This assumption could have negative implications for an organization. Instead organizations should begin to review the best practices for design of Web-based courses and integrate these practices and associated principles into the design of courses.

This study also has impact for faculty in higher education who are in the role of instructional designer as well as instructor as they design courses for adult learners. Like instructional designers, instructors are key to the success of Web-based instruction. Although scores of faculty in higher education offer courses online, few have been trained in the proper development and execution of Web-based courses (Irani & Telg, 2001). Hence, instructors can find Web-based instruction a challenge, particularly in the implementation of adult learning principles. Like the instructional designers who participated in this study, faculty may be omitting critical adult learning principles in the design of Web-based instruction. This study shows a need for professional development not only for instructional designers, but for faculty in higher education as well.

### *Student Retention*

The June 2001 issue of *Syllabus* reports that twenty to fifty percent of students drop out of Web-based courses. One of the most common reasons students give for dropping out of a Web-based course is the inexperience of the instructor (Frankola, 2001). The adult learners who participated in this study identified barriers that impede the successful delivery of Web-based instruction. The identified barriers were all functions of instructor-learner interactions. This study supports the premise that learner-instructor interactions via technology require proficiency on the part of the instructor in the area of teaching in a Web-based environment. If faculty do not teach effectively in an online environment, the effects could have implications for learning as well as for student retention in Web-based training/instruction programs.

### *Impact for Future Research in Adult Education*

As Web-based training/instruction continues to grow at a rapid rate, it is important that additional research be conducted in this area. This study has implications for future research in student retention and attrition, and the extent to which technology and the instructor in a web-based environment might add to student retention in online educational programs. Investigating experiences of students from different cultural and ethnic backgrounds could expand the barriers reported by students in this study. These outcomes could assist educational administrators in identifying difficulties in Web-based courses that may contribute to course completion rates for all students. Research focusing on faculty and their ability to teach effectively in an online environment is a major focus for further study. This implication is of extreme importance because of the increasing number of courses being converted from face-to face to online environments and the importance of interaction between learners and instructors.

The analysis presented in this report only touches the surface of the research needed in Web-based training/instruction. This study will help faculty, instructional designers, and administrators to plan for professional development and instructional design. In addition, adult educators can now have an understanding of the importance of applying adult learning principles to teaching and learning in a Web-based environment.

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